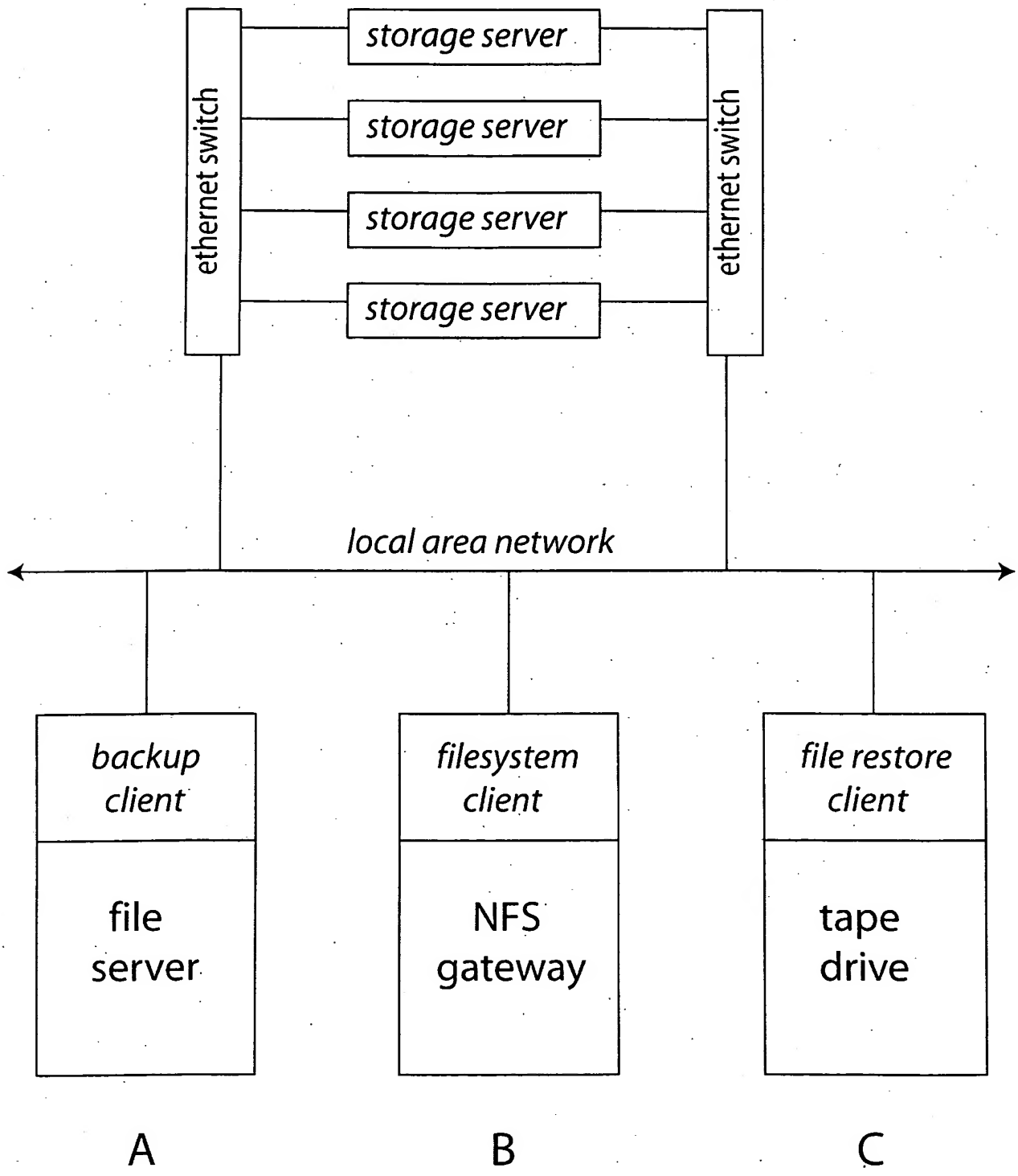
storage server
storage server
storage server
storage server
ethernet switch
ethernet switch
local area network
backup client
file server
filesystem client
NFS gateway
file restore client
tape drive
A
B
C

FIG. 1

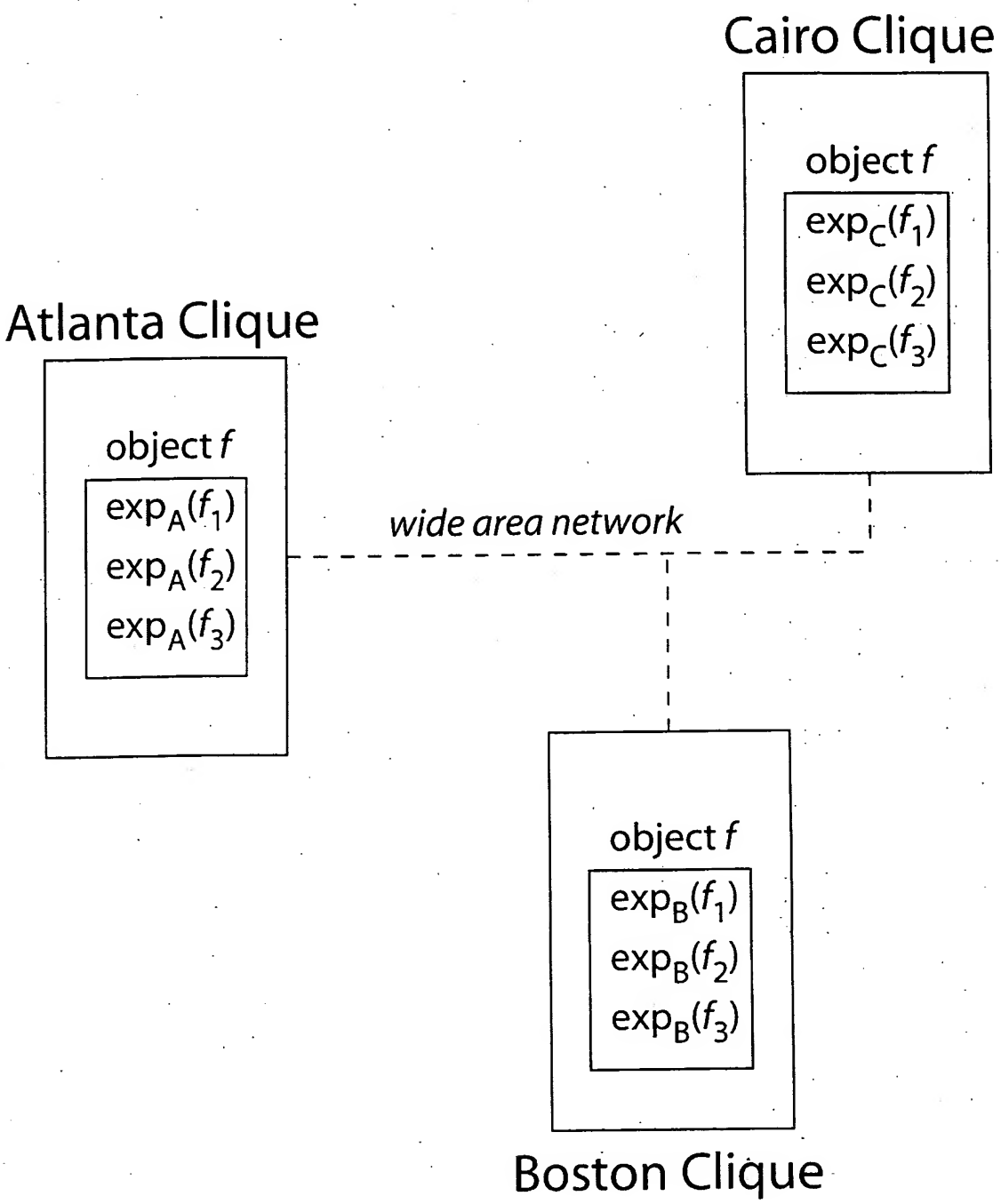
Cairo Clique
object f
$exp_C(f_1)$
$exp_C(f_2)$
$exp_C(f_3)$
Atlanta Clique
object f
$exp_A(f_1)$
$exp_A(f_2)$
$exp_A(f_3)$
wide area network
object f
$exp_B(f_1)$
$exp_B(f_2)$
$exp_B(f_3)$
Boston Clique

FIG. 2

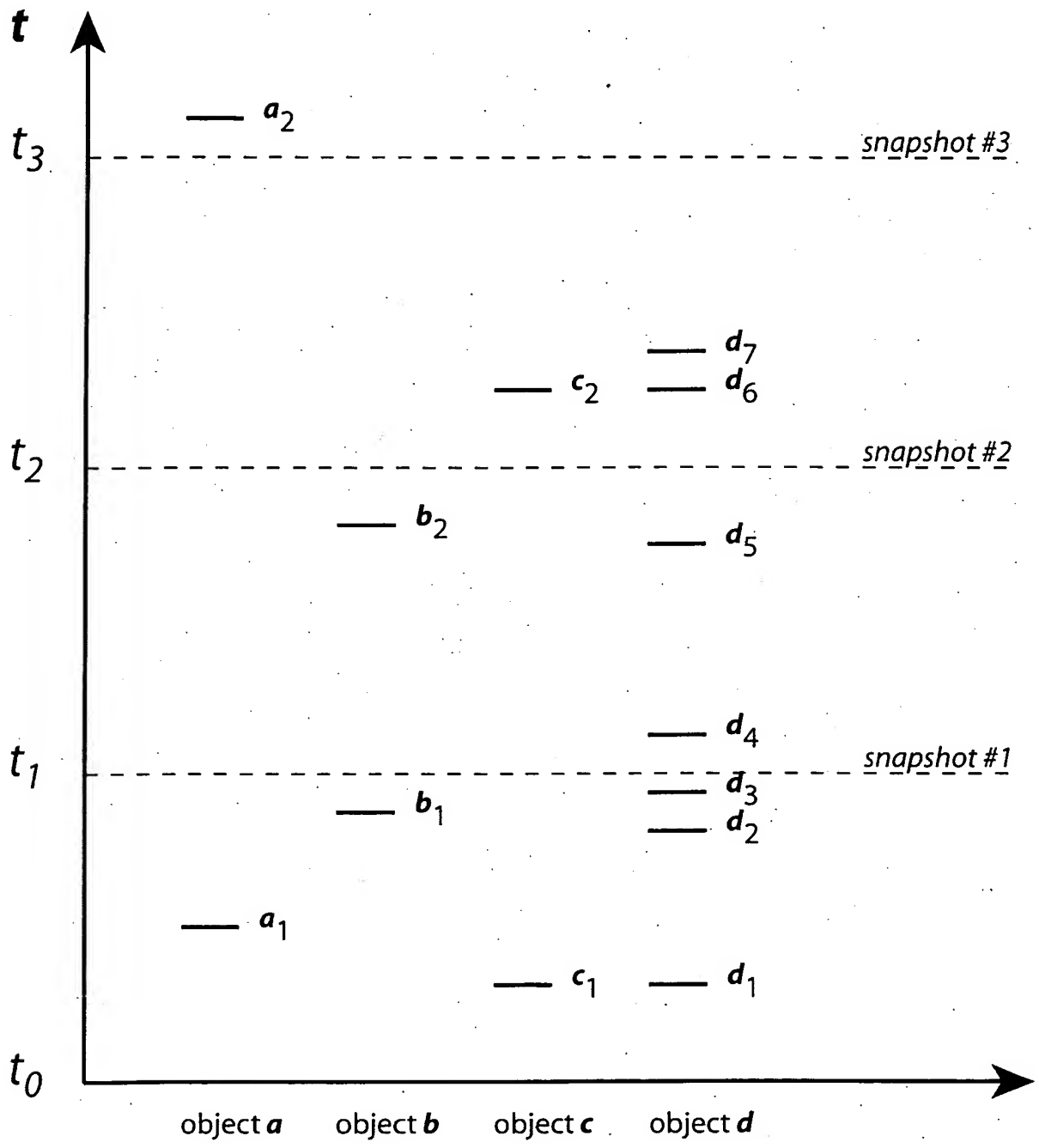
t
t3
t2
t1
t0
snapshot #3
snapshot #2
snapshot #1
a2
a1
b2
b1
c2
c1
d7
d6
d5
d4
d3
d2
d1
object a
object b
object c
object d

FIG. 3

	event	*time specified*	*no expiry counter*	*1000 days counter*	*100 days counter*	*scheduled expiration*
1)	block creation	2003, day 47	0	0	0	2003, day 57
2)	add expiration	2003, day 109	0	0	1	2003, day 147
3)	add expiration	2003, day 140	0	0	2	2003, day 147
4)	add expiration	2004, day 2	0	1	2	2005, day 318
5)	remove expiration	2003, day 109	0	1	1	2005,day 318
6)	add expiration	2007, day 21	1	1	1	no expiration
7)	remove expiration	2007, day 21	0	1	1	2005, day 318
8)	remove expiration	2004, day 2	0	0	1	2003, day 147
9)	becomes current	no expiration	1	0	1	no expiration
10)	current superseded	2003, day 79	0	0	2	2003, day 147
11)	add expiration	2003, day 50	0	0	2	2003, day 147

FIG. 4

Event 3 Reference Message:

<policy> deletion requires namespace authorization </policy>
<expiration_time> 2003, day 140 </expiration_time>
<namespace_id> 10723 </namespace_id>
<location_hash> 1172325143219 </location_hash>

Event 9 Reference Message:

<policy> if current at hour 0 of week, keep for a month;
if current at hour 0 of month, keep forever </policy>
<creation_time> 2003, day 49 </creation_time>
<expiration_time> no expiration (current) </expiration_time>
<namespace_id> 21031 </namespace_id>
<location_hash> 2210719210978 </location_hash>

After Event 11:

100_day_counter	=	hash(Event 3 Reference Message) + hash(Event 9 Reference Message)
1000_day_counter	=	0
no_expiry_counter	=	0

FIG. 5

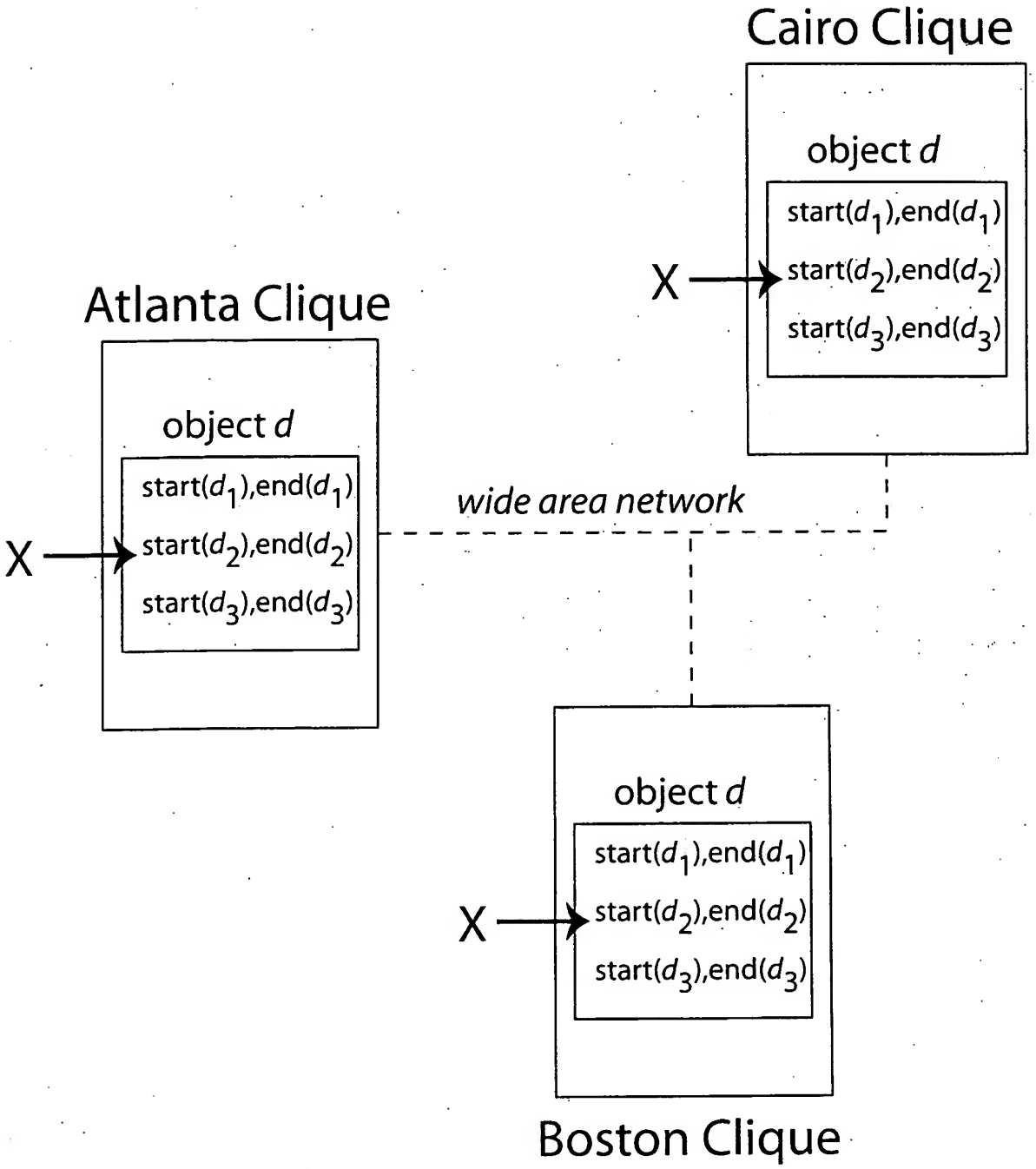
Cairo Clique
object d
start(d_1),end(d_1)
start(d_2),end(d_2)
start(d_3),end(d_3)
X
Atlanta Clique
object d
start(d_1),end(d_1)
start(d_2),end(d_2)
start(d_3),end(d_3)
X
wide area network
object d
start(d_1),end(d_1)
start(d_2),end(d_2)
start(d_3),end(d_3)
X
Boston Clique

FIG. 6